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DEFENSE SYSTEMS MANAGEMENT SCHOOL

STUDY TITLE: Management of Development and Initial Production of Air Munitions and Related Equipment in the USAF

The purpose of this paper is: (1) To,

STUDY PROJECT GOALS:

To identify the management organizations and process involved in the movement of projects from late advanced development through engineering development to initial production; to determine strengths and weaknesses of the overall management process and examine the application of selected DOD major system acquisition policies to the process.

(and (2))

STUDY REPORT ABSTRACT:

An overview of the structure of munition development and initial production is provided in terms of the who-- organizations involved; the what-- projects, and the where-- program elements.

The management process of taking an item from advanced development through engineering development to initial production is described and discussed using interviews, the author's personal experience and reports and other documentation.

Several key conclusions and recommendations are presented in the areas of requirements documentation, organization and transition from phase to phase in the development process.

KEY WORDS

MATERIEL PRODUCTION MUNITIONS AIRCRAFT AIRCRAFT SUPPORT ROC (v. p. 13) WEAPONS SUPPORT

Key Words: Munitions, Management Methods

NAME, RANK, SERVICE	CLASS	DATE
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DEFENSE SYSTEMS MANAGEMENT SCHOOL

PROGRAM MANAGEMENT COURSE
INDIVIDUAL STUDY PROGRAM

MANAGEMENT OF DEVELOPMENT
AND INITIAL PRODUCTION OF
AIR MUNITIONS AND RELATED
EQUIPMENT IN THE USAF

STUDY PROJECT REPORT
PMC 76-1

ALAN E. HABERBUSCH
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Study Project Report

Individual Study Program

Defense Systems Management School

Program Management Course

Class 76-1

by

Alan Edward Haberbusch
Major USAF

May 1976

Study Project Advisor
Mr. R. K. McIntosh

EXECUTIVE SUMMARY

The purpose of this study is to provide an understanding of selected management areas of the USAF development and initial production of air munitions and related equipment, to analyze that management and make recommendations where appropriate.

We cannot afford a repeat of the poor technological state of the conventional munition stockpile at the start of the Vietnam War. While there are many on-going development programs today, there is concern over the way requirements are generated, transitions are made from phase to phase and the way the Armament Development and Test Center is organized to conduct development and initial production.

Requirements documents are being used like supply requisitions. If the user sees something he likes, he writes a requirement to get it into engineering development. We need to apply the full intent of the requirements process initially by requiring broad capability requirements which challenge the developer to generate alternatives. The transition from advanced development to engineering development is not getting enough scrutiny. The ADTC Acquisition Review Countil (a mini-DSARC) should be convened to review all such transitions. The Council is reviewing all programs being proposed for transition to initial production and is providing credible recommendations. The organizational dichotomy of ADTC between engineering

development and initial production is hindering effective early consideration of logistics and is hampering production planning. These functions need to be under the same organization within ADTC.

Other investigators as well as this author have come to similar conclusions, but have not necessarily made similar recommendations. It remains to be seen exactly what changes will be made, but one thing is certain - changes are needed.

ACKNOWLEDGEMENTS

I wish to express my gratitude to the people who assisted me in the preparation of this study report.

Those people at HQ USAF, HQ AFSC and ADTC who took time from their busy schedules to be interviewed and respond candidly.

I wish to thank Mrs. Harriett Langford for an outstanding and always on schedule typing performance.

A special note of thanks to my wife Marianne who steered the family ship with two daughters, a 2 1/2 year and a 5 month old, while I labored over this paper. Also to my 2 1/2 year old, Holly, who despite her age understood that daddy had to "erk" (sic) (i.e., work).

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MANAGEMENT OF DEVELOPMENT AND INITIAL PRODUCTION OF AIR MUNITIONS AND RELATED EQUIPMENT IN THE USAF

CHAPTER I

INTRODUCTION

"The mission of the Air Force is to fly and to fight."

These words provide the essence of the Air Force mission. An equally important corollary is the following:

"Without munitions the Air Force is just another unscheduled airline."

This second quotation hung on the wall of the Munitions Control Center, HQ 7th Air Force, Ton Son Nhut Air Base, Republic of Vietnam, during the Vietnam conflict. Initially, it appears humorous, but upon reflection it reveals an essential truth - the Air Force can fly without munitions but cannot fight without munitions.

At the beginning of the Vietnam War, the Air Force had highly sophisticated aircraft but few if any conventional munitions* which matched the capability of these aircraft. Why did this happen? Between the Korean War and the Vietnam War, there was little effort to develop new conventional weapons (1:2)[1]. This lack of activity followed from the thinking that

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*This notation will be used to direct the reader to the Appendix A - Definitions (p. 35)

[1]This notation will be used throughout this Study Report for references. The first number is the source in the List of References. The second number is the page in the reference.

another conventional war would not be fought. The Vietnam War injected large funding increases into conventional weapons development and production. Many programs were conducted on a crash basis for specific Air Force requirements in Vietnam. With the end of the Vietnam War, the development and production process has become more orderly. There are currently a wide range of conventional munition developments under way from sophisticated standoff guided glide munitions* down to direct attack* cluster bombs, mines, and munitions handling equipment.

The very sophisticated standoff and other guided munitions are very costly and will ultimately represent an important capability for attacking a limited number of very high value targets. The large majority and "backbone" of the conventional weapons stockpile is and will continue to be the unguided direct attack munitions which are less costly, can therefore be bought in large quantities, and used effectively against a large target spectrum.

PURPOSE OF THE STUDY

The focus of attention is usually on the standoff and other guided weapons. The purpose of this study will be to give the reader an appreciation for the lesser known conventional weapons development and initial production process, its organization, its strengths and weaknesses. In so doing, the writer will develop some recommendations for the further management of these programs. To avoid a repeat of the post-Korea pre-Vietnam situation, the management of these programs must be

accomplished efficiently and effectively because of the

> "...future forecast of a worsening DOD budget squeeze" (2:2)

PROJECT SCOPE

The project will be limited to an examination of the management of conventional weapons and related equipment whose engineering development is conducted under Program Element 64602F, "Armament Ordnance Development," and Program Element 64610, "Target Activated Munitions." The examination will cover from late advanced development through engineering development to initial production. Development items in these program elements, when put in production, form what was previously referred to as the "backbone" of the conventional munitions stockpile.

The writer will use a combination of seven years' experience in the area and interviews with those involved in the management of these programs, from HQ USAF down to the field level, to provide the basis for the analysis included in the study.

REPORT ORGANIZATION

Chapter II provides a brief description of the "who, what and where" of the conventional munitions management structure. This covers the organizations, the items, and the program elements. Chapter III traces the flow of projects from late advanced development through engineering development to initial production. An integral part of Chapter III will be a discussion and analysis of the structure, process, strengths and

weaknesses, and as appropriate, application of Department of Defense (DOD) major system policy.

Chapter IV gives the study conclusions and recommendations. Chapter V suggests some areas for possible future study.

CHAPTER II

THE STRUCTURE

The structure for development and initial acquisition includes the "where, what, and who" described by the program elements, projects and the organizations involved in managing the program elements.

PROGRAM ELEMENTS AND PROJECTS

The items being considered in this study fall in five different program elements (PE) as they proceed from advanced development through engineering development to initial production. These program elements and projects as appropriate are shown in Table 1 (3:4)(4:3)(5:33,44). Under PE 63601F/Project 670A there are currently (FY76) six tasks with a total funding of approximately $1000K which may eventually proceed to PE 64602F/64610F for full scale development. The projects under PE 64602F/64610F have 14 tasks being performed (FY76) which, if successfully completed and approved for production, will proceed to either PE 28030F or PE 27241F. PE 64602F has approximately $6600K funding in FY76 and PE 64610F has $7400K funding for FY76. While these amounts are rather modest when spread over the number of tasks involved, the funding for production of these items is potentially very large by comparison. For example, the production of a recent cluster bomb over a three fiscal year period was approximately 70 million dollars for approximately 78,000 units. Table 2 shows a breakout of the funding sources (6:48,51).

Program Element	Project	Title
63601F		Conventional Weapons
	670A	Conventional Weapons Technology
64602F		Armament Ordnance Development
	2586[2]	Clusters and Bombs
	3133	Fuzes
	4135	Fuel Air Explosives and Flares
	5613	Munitions Carriage, Release, and Handling Equipment
64610F		Target Activated Munitions
	2215	(X)[3] Gator Anti-Tank Mine
	2573	Standoff Target Activated Mine
	2292	(X) SUU-54 Ballistic Mine Dispenser
	2293	Pihranha Shallow Water Mine
28030F		War Reserve Material Ammunition
27241F		General Purpose Forces

TABLE 1

[2]Tasks are shown in Appendix B

[3](X) Managed by Deputy for Armament Systems (ADTC/SD). All others by Air Force Armament Laboratory (ADTC/DL).

Appropriation	Budget Program Activity Code	Program Element
3600	660000	63601F 64602F
RDT&E	Ordnance, Combat Vehicles and related equipment	64610F
3080	810000	28030F
Other Procurement	Munitions and associated equipment	27241F
3010	120000	
Aircraft Procurement	Common Aerospace Ground Equipment	27241F

TABLE 2. FUNDING SOURCES

ORGANIZATIONS

Figure 1 depicts the basic structure of the organizations directly involved in the management of the development and production of the items being considered in this study. The organizations inside the dotted lines will be given the attention in this study, since these organizations control, direct and expend the majority of the resources in the development and initial production of munitions and related equipment.

The following is a brief description of each organization's (below Chief of Staff level) responsibilities as they apply to this study (7)(8)(9). For clarity and potential use by the reader, the office symbols and titles will be expanded in the text to a lower level than indicated in Figure 1. This is in

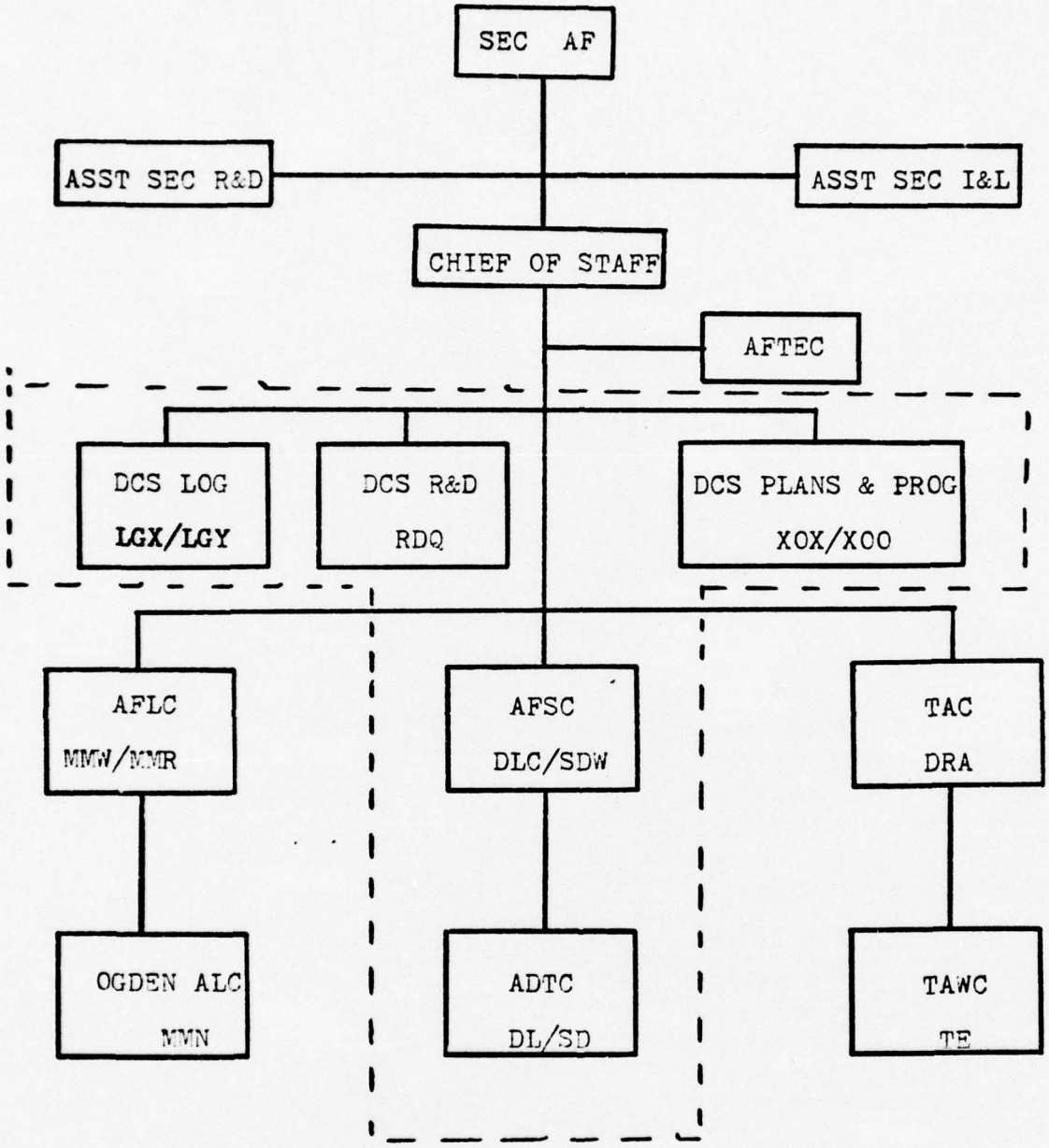
SEC AF
ASST SEC R&D
ASST SEC I&L
CHIEF OF STAFF
AFTEC
DCS LOG
LGX/LGY
DCS R&D
RDQ
DCS PLANS & PROG
XOX/XOO
AFLC
MMW/MMR
AFSC
DLC/SDW
TAC
DRA
OGDEN ALC
MMN
ADTC
DL/SD
TAWC
TE

Figure 1

consonance with the study philosophy which is to approach everything at a level where, in the author's opinion, people know the most about the management being studied.

HQ USAF

RDQRM - Armament Division. Advocates, consistent with operational need and realistic costs, advanced armament and ordnance concepts and issues Program Management Directives for advanced and engineering development of these armament items.

LGYW - Munitions and Missiles Division. Maintains control over production, storage, and distribution of munitions, adjusts production schedules based upon logistic/fiscal guidance, production capability, force structure, and operational requirements.

LGXP - Other Procurement Programs Division. Plans, develops, formulates and substantiates the Air Force Other Procurement Appropriation (3080). Issues funds for items approved for production. (This includes all items in this study except Munitions Handling Equipment.)

LGXW - Aircraft and Missile Programs Division. The same functions as LGXP except the functions are done for Air Force Aircraft Procurement Appropriation (3010). (This includes only Munitions Handling Equipment in this study.)

XOXFC - Command Planning Division. Prepare the Nonnuclear Consumables Annual Analysis (NCAA) which develops the

Inventory Objectives (I/O's) for conventional munitions by means of calculations which account for cost, effectiveness, attrition, aircraft carriage and delivery capability, and target mix.

XOOFA - Operational Test and Evaluation Division. Receives Initial Operational Test and Evaluation (IOT&E) reports. Air Staff focal point for operational coordination on production decisions.

HQ AFSC

DLCA - Avionics and Munitions Division. Manages and issues direction for advanced development of non-system munition programs (PE 63601F, Project 670A).

SDWM - Munitions Division. Manages and issues direction for engineering development and initial production of non-system munition programs (PE's 64602F, 64610F, 28030F, 27241F).

ADTC

DLJ - Air Force Armament Laboratory, Munitions Division. Manages all advanced and most engineering development (see Appendix B).

SD3 - Deputy for Armament Systems, Munitions System Program Office (SPO). Manages some engineering development (see Table 1 and Appendix B) and all initial production.

HQ Air Force Logistics Command and Ogden Air Logistics Center

Manage the munitions inventory and make procurement of items after AFSC completes initial production.

HQ Tactical Air Command (TAC) and Tactical Air Warfare Center (TAWC)

Develops operational requirements and interfaces with HQ AFSC and ADTC during development. Plan, conduct and report on IOT&E.

Air Force Test and Evaluation Center (AFTEC)

Approves IOT&E plans and reports before test conduct and prior to issuing the report to HQ USAF and other agencies[4].

OTHER ORGANIZATIONS

The Air Munitions Requirements and Developments (AMRAD) Committee was established in 1969. The Committee reviews proposed Air Munitions developments and advises ODDR&E regarding Joint Service applicability. Each Service is represented on the Committee which is composed of three Colonels and a Navy Captain. A Joint Service Agreement (10) was signed to foster greater standardization and reduce proliferation of all air launched munitions entering the inventory by harmonizing Service requirements. A Joint Requirement is defined as a requirement for an item of common use jointly agreed upon by two or more Services. Joint development and procurement is implied.

[4]All IOT&E's of items in this report are Major Command conducted as defined by AFR 23-36, AFTEC.

CHAPTER III

THE PROCESS

This chapter describes and discusses several significant management areas in the process of taking an item from Advanced Development through Engineering Development to Initial Production. The areas that are covered are requirements, reprogramming flexibility, testing, transition between phases and others which are peculiar to each of the three phases being discussed. The discussion includes material from interviews, personal experience and documentation. The author conducted eleven interviews with people assigned to HQ USAF, HQ AFSC and ADTC. The author has had four years experience as a project engineer at the Armament Development and Test Center, Air Force Armament Laboratory (ADTC/DL) and three years as a staff officer in the HQ AFSC Munitions Directorate (SDW). The documentation used for reference is shown in the bibliography. Where applicable, events are discussed in light of DOD major systems policy contained in DOD Directives. The author recognizes that biases are present in both the interviews and his personal experience. However, these are the people who have to live and work with the process and in the author's view provide the best view of how it works or should work.

ADVANCED DEVELOPMENT

Assume that the item to be traced is in Advanced Development. The development of the item may have started due to a

user Required Operational Capability (ROC), an industry idea from Independent Research and Development (IR&D) or an in-house Air Force idea. Overall, advanced development according to Dr. Currie is a place for

> "creation and demonstration of options (11:40)

REQUIREMENTS

In this study, the interest is focused on those items that are being developed toward eventual satisfaction of a ROC. The ROC development process is well defined in Air Force Regulation (AFR) 57-1, Required Operational Capabilities. This regulation implements the policy in Department of Defense Directive (DODD) 5000.1 that the Services are responsible for determining their needs. The basic thrust of AFR 57-1 is that needs should be expressed in terms of the capabilities required so that the developer can generate possible solutions. However, the intent of the process is not being followed. The Tactical Air Forces (TAF)* are submitting ROCs to support the development of specific items, rather than identifying mission capability deficiencies in operational terms (12:2). Basically, the users are seeing items they "like" being brought along in advanced development or being proposed for advanced development and then writing a ROC for that specific item. This process leaves little incentive for AFSC to propose alternative solutions. Theoretically, the process of providing draft ROCs to AFSC for comments should reduce this problem, but it is not. The user is under no

obligation to change his draft ROC based on the comments and many times does not change it.

The interviews indicated that both mission capability ROCs and specific item ROCs were appropriate, but at different times in the development process. The overall feeling was that capability ROCs are appropriate until one or more alternatives have been demonstrated as state-of-the-art, then it is appropriate to refine the ROC to request one of the demonstrated solutions and to provide more detailed parameters. It is interesting to note that no one interviewed thought the users should be bound to change the draft ROC based on the comments, but also that the user should not get much leverage in deciding the details of how to meet the ROC.

REPROGRAMMING FLEXIBILITY

According to the interviews, there is sufficient flexibility within PE 63601F to redistribute funds to accommodate changing priorities and conditions. HQ USAF gives HQ AFSC latitude to shift funds within the PE subject to a five day prior notification. If there is no objection, the transfer may proceed. This same flexibility is passed on to ADTC by HQ AFSC. An additional question was "should the funds be concentrated in a few areas rather than be spread across many areas as they are now?" This question arose from Dr. Currie's suggestion that we need to field more systems on a priority basis and that delaying activity in some areas may be required to do this (11:40). The interviews indicated that some portions of the funding might be "fenced off" for this purpose, but to fulfill

Dr. Currie's other idea of creation and demonstration of options there must be some funds available for "innovation and creativity."

TESTING

The user participates in the advanced development on a monitor basis and that role continues into the testing phase. The advanced development tests are used to demonstrate technical feasibility. In major systems, the user many times participates directly in the testing. The scope and nature of the advanced development tests in the munitions area do not lend themselves to direct user participation. Only a few test items are usually available and only a very few are totally live* items. Since all the items are usually destroyed in flight drop tests, they must be used to satisfy development tests rather than operational tests. The basic constraint is the large number of items that would be required to obtain flight certification of the operational delivery condition and the time it would take to accomplish the certification.

TRANSITION TO ENGINEERING DEVELOPMENT

Is the item ready to be approved for engineering development? The first question within this question is what ADTC organization should manage the engineering development? Currently, the responsibility is divided between the Air Force Armament Laboratory (ADTC/DL) and the Deputy for Armament Systems (ADTC/SD) (see Table 1 and Appendix B). The decision on "who" is made on a case-by-case basis (9:1). The author has observed that since SD now has some engineering development

responsibility that DL feels SD is trying to "steal" the remainder now under DL. The close working relationship required between DL and SD to provide a smooth transition between engineering development and initial production is destroyed because of this atmosphere. This conflict is definitely unhealthy and inefficient (14). Once an organization is designated several checkpoints are required by HQ USAF before they approve an item for transition to engineering development (PE 64602F/64610F). The details of these steps are provided in Appendix C. Basically, HQ AFSC must provide a firm recommendation to proceed into engineering development and provide a Program Management Plan for engineering development to HQ USAF. These tasks in turn fall to ADTC to accomplish. The users must also comment on the proposed transition. This is not unlike the process for major systems at DSARC II, although no formal meeting like the DSARC is required. The ADTC may hold an Acquisition Review Council (ARC), essentially a mini-DSARC, depending on the nature of the program (9:3) (13:1). Currently, the ARC is not being used for this transition. If no ARC is held, an appropriately staffed documentation package is used to provide the recommendations to HQ AFSC. Regardless of the ADTC methodology, neither HQ AFSC nor HQ USAF have any formal meeting required to review the recommendations to proceed to engineering development. The recommendation is staffed through offices deemed appropriate by the responsible Systems Officers (SYSTOs) at AFSC and the Program Element Monitors (PEMs) at HQ USAF. A recent Air Force

report recommends establishment of formal reviews by AFSC at the transition point between advanced and engineering development. Most of those interviewed did not agree with that idea if it meant using a formal committee at AFSC and/or HQ USAF. Although Dr. Currie indicates the DSARC II, to which this situation equates, is the key decision point, it would appear that in an increasing workload declining manpower situation more and more formal review bodies are not practical.

In addition, since a three letter office coordination is required at HQ USAF to approve transition (i.e., a one or two star general) it would seem that this satisfies the intent of a level of review commensurate with the program size as indicated by DODD 5000.1.

One other step must be taken before an item approved for engineering development. The ROC must be harmonized with the other Services. This process must be started within nine months after the start of advanced development (10:4). The AMRAD Committee oversees operation of this procedure. Based on the other Services comments on the ROC, the Committee places the item in a standardization category. Joint engineering development and production will follow if agreement is reached that there is ajoint requirement. Lesser degrees of standardization lead to joint development or single service development. There is more discussion of joint programs under engineering development.

At this point, if all required actions have been accomplished, the item would transition to engineering development.

ENGINEERING DEVELOPMENT

Virtually no item enters engineering development without a validated ROC. This upholds the basic concepts of DODD 5000.1 that there be a confirmed need for the item before proceeding. The first task is to insure that the statement of work and/or system specification accurately translate the ROC into a detailed description of the required item. This task is the responsibility of both HQ AFSC and ADTC. In practice, most of the work is done by ADTC. Even though many ROCs today are for specific items as mentioned previously, they still don't have all the necessary details to formulate a specification and/or statement of work. An example of things that require added detail over and above the information contained in the ROC may be helpful. Many ROCs specify a requirement for supersonic carriage of munitions. While some specify a maximum mach number, this is still not enough. What is required is an altitude, and a time as well as maximum mach number so that the aerodynamic heating environment can be defined. There is currently no formal way to get this job accomplished and no directives which cover who is responsible (12:19). As a result programs begin with the best available description and often result in a product that the user does not want. An example, is the Munitions Handling Equipment Shuttle Trailer. The user said it was too large. Possibly, if a hard look and some formal agreement or specific limits had been established at the

outset, this could have been prevented. This is also a continuing problem as development proceeds and tradeoffs are required. The users participate in design reviews, but many times do not understand the ramifications of proposed tradeoffs and cannot "speak" definitively for their command. The author has viewed this activity first hand many times. What then results is a lengthy exchange of correspondence attempting to resolve the problem. HQ TAC and ADTC have instituted a periodic ADTC-TAC Requirements Review at the Brigadier General-Colonel level. This should help solve both the initial and continuing resolution of the problems discussed above.

Those interviewed generally, although not unanimously, supported formal resolution and documentation of initial detailed parameters and also the formal resolution of tradeoffs and changes as the program progressed through engineering development. No one offered any specific means of accomplishing this formalization.

REPROGRAMMING FLEXIBILITY

As in advanced development, those interviewed felt there was sufficient flexibility to shift funds. HQ USAF gives HQ AFSC which then allows ADTC to reprogram funds within the PE, but requires an after the fact notification. In practice, the changes are discussed informally with all parties before any changes are made

Those interviewed were also asked whether they felt there too many tasks being attempted and should a more concentrated effort be undertaken on fewer tasks? The responses were

generally in agreement that some prioritization might be done by broad categories, possibly by project, as a means for assigning funds, but that at any lower level such activity would make for constant and disruptive restructuring due to continually changing priorities. Two additional points were brought out. The first was that no one was convinced that more funds necessarily make for a shorter time to completion of any given task. Also, if an area is continually delayed by lack of funds the manpower will be used elsewhere and the expertise and in-house knowledge on the subject will "dry up." This would make future activity in this area very slow starting or not possible at all.

PRODUCTION PLANNING

During engineering development it is necessary to begin production planning. ADTC through HQ AFSC must provide key data to HQ USAF (XOOFC) to allow a computation of the projected War Reserve Material (WRM) Inventory Objective (I/O). The key data includes effectiveness, cost, delivery envelope and aircraft loadouts. This is then used in an array of computer computations that consider target characteristics and mix, aircraft attrition, effectiveness, cost effectiveness, aircraft carriage and delivery. These computations assess the capability of the new item versus other items projected or already in the inventory. The result is the WRM I/O. ADTC then must plan a production program to meet the I/O. This process must necessarily occur well in advance of the first projected production so the program can get into the POM.

This early input requirement surfaces the two biggest problem areas. The first is the "chicken-egg" cost problem. The cost varies greatly depending on quantity, so it would be good to know "how many" before an input was made on how much it cost. However, this can't be done since the I/O, "how many" is determined based on the inputs. This problem is being solved now by providing a cost versus quantity input for several quantities so that the cost variability due to quantity is visible very early to HQ USAF. The second problem is that the key parameter of effectiveness is not fully defined until after DT&E/IOT&E testing. However, because of the budget lead time the best estimate must be provided. There has been some reluctance by ADTC to provide these estimates because it is feared that the item would not compete with existing items in the computer computation and the program might be suspect based on early data. This problem is being addressed by providing ADTC the complete computer methodology. This will allow the methodology to be used as a design tool. That is it will show what effectiveness or other parameters a new item should have to be competitive and be included in the WRM stockpile. An assessment can then be made about the possibility of reaching the required parameters and potentially reduce "false starts" which are not now identified until late in engineering development during the WRM I/O computation process.

The planning for munitions handling equipment is conducted by HQ AFLC and HQ AFSC, with HQ AFLC making the final input to HQ USAF. This is done to allow AFLC to properly phase down

production and repair of equipment that will be replaced by the new equipment.

TESTING

Testing in engineering development is greatly expanded over advanced development and normally includes independent testing by the user. This is in consonance with both DODD 5000.1 and 5000.3. All IOT&E is conducted by a major command, usually TAC, with appropriate approvals on test plans and reports from the Air Force Test and Evaluation Center (AFTEC). There is a continuing disagreement between AFSC and TAC on "how much is enough." Both DODD 5000.1 and its Air Force implementation (AFR 80-14) indicate the purpose of IOT&E is to provide a valid estimate of the operational suitability prior to the first production decision. In addition, AFR 80-14 indicates the purpose of FOT&E is to verify the estimates from IOT&E. The users tend to want more IOT&E than the developer thinks is required (i.e., what is a valid estimate?). The final arbiter many times are the funds required. The Air Force Budget Manual says that no Procurement Appropriation funds can be spent until after the user and developer both make a positive recommendation. This then constrains the user since the RDT&E funds for munitions engineering development are well bracketed, the user must tradeoff how many items must be bought for IOT&E on one program at the potential expense of timely continuation of other programs in the program element. While this restriction may cause some poor items to be

recommended for production, on the whole, if it were not there, the author's experience indicates IOT&E would be more like FOT&E.

LOGISTICS

Logistics considerations should be a major consideration during engineering development. Because of the current separation of engineering development responsibility at ADTC between ADTC/DL and ADTC/SD, this is not always the case. The author observed that because DL is not responsible for production they pay heavy attention to technical excellence at the expense of logistics consideration. In addition, SD has only a few experienced people in the logistics area (14). An example of the problem is the FMU-112 fuze. ADTC was going to change a screw on booster to one which was molded on to save cost. However, this would have prevented access to an acceptance test plug. This would prevent non-destructive testing of fuzes in storage. A first step to remedy this problem was taken in August 1974 when AFLC established a field extension of their Acquisition Directorate at ADTC. In essence, they are acting as a Deputy Program Manager for Logistics (DPML) for all of ADTC. As of March 1976, the organization had seven AFLC people and two ADTC people assigned.

JOINT SERVICE PROGRAMS

The aspect of joint program and the AMRAD Committee were briefly mentioned in the discussion of advanced development. There are currently three joint programs in engineering

development. They are the Gator Mine, the Air Inflatable Retarder, and Fuel Air Explosives (FAE) II. Those interviewed were asked to comment on joint programs. They were of the unanimous opinion that while good in theory they were not working in practice. The main reason given was that old ways are hard to change and small points become big issues whenever any Service prerogatives seem to be challenged. It was generally agreed that more time and money used than if each Service went its own way. The author supports these thoughts to a limited degree having participated in the FAE program. Since started in 1971, no engineering development program has yet gotten to an initial production decision. If one program can succeed, maybe it will bring confidence to the procedure.

TRANSITION TO INITIAL PROLUCTION

Given all the obstacles discussed, programs still get through engineering development. What then are the procedures for going into initial production. HQ USAF establishes these procedures by Program Management Directive (PMD). The following is from the FY 76 PMD for PE 64602F

> "PROCEDURES FOR TRANSITION FROM ENGINEERING DEVELOPMENT TO PRODUCTION: Upon completion of DT&E and IOT&E, AFSC[5] and the

[5]Underlines added for emphasis

> appropriate operating command will submit independent recommendations to AF/RDP[6] and AF/XOO, respectively, with information to LGY, LGX, RDQ and XOX. Recommendations for Pilot Production* will certify that; the item has successfully completed development, testing has provided a valid estimate of the operational utility and suitability and the item is ready for Pilot Production. When approved, separate direction and funding to initiate Pilot Production will be provided."(4)

ADTC convenes an Acquisition Review Council (13:1) on all recommendations they provide to HQ AFSC. Normally, the ADTC Commander chairs the council. It is, as mentioned previously, a mini-DSARC. The recommendation from HQ AFSC to HQ USAF and the subsequent direction to proceed from HQ USAF are the results of staffing a documentation package as described earlier in the transition from advanced to engineering development.

INITIAL PRODUCTION

Now that the item has been approved for initial production, the requirements document should become fairly static and the objective is to mass produce an item which continues to meet the requirements that the soft tooled or hand produced item did in IOT&E. The follow-on OT&E (FOT&E) essentially gathers

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[6]RDQ vice RDP as of March 1976

statistical data using pilot production items to support the estimates made with limited quantities of test items during IOT&E.

REPROGRAMMING FLEXIBILITY

Initial production items become individual line items in the budget. Those interviewed indicated there was sufficient reprogramming authority from line to line. Although HQ USAF must approve all reprogramming to prevent violation of Congressional intent, the author has observed that the field requests for such actions are approved in most cases.

BUDGET AND APPORTIONMENT

As noted in the engineering development section, production planning takes place some several years in advance because of the budget cycle. This takes place before IOT&E so the actual start of initial production is very development and test schedule dependent. A budget review meeting chaired by HQ USAF (LGXP) is held twice a year to deal with changes due to schedules, OSD cuts, changes in I/O due to change in threat or other guidance. Participants come from HQ USAF, AFLC, AFSC, ADTC and Ogden Air Logistics Center. The meeting in the Fall reviews all items and formulates the budget submissions and the meeting in the Spring serves to formulate the apportionment request. These reviews are the key to getting things done, but are also the source of some significant problems.

The ADTC presents a briefing on items nearing readiness for initial production as well as those already in initial production. Each of these items has to be costed for the outyears based on quantity and fiscal guidance from HQ USAF. HQ USAF in turn depends on OSD for fiscal guidance. Unfortunately, this guidance is often issued so shortly before the review meetings that providing meaningful cost data for items, tooling, etc., is extremely difficult. If the quantities and funds are changed significantly and since the costs are not linear with the quantities, the entire program must be re-costed each time such a change is made from the planned (FYDP) program. Those interviewed at HQ USAF indicated that while regrettable this process is a function of the PPBS process and saw no way to provide any relief from this problem.

After FOT&E is completed, a recommendation is made to begin full scale production. The procedure is the same as described for transition from engineering development to initial production. The item is usually transitioned to AFLC for buys beyond the first full scale production buy.

Munitions handling equipment budgets and apportionment requests are handled without any formalized meetings as described for munitions. HQ AFSC and ADTC work closely with HQ USAF, HQ AFLC and San Antonio Air Logistics Center on these matters.

THE ONE THING TO CHANGE

At the end of each interview, the question was asked, "If you could change one thing about the way we do munitions development and initial production, what would it be?" There was no trend to one subject area in the answers. The following condensed versions of the answers are provided for consideration by the reader:

- Better 10-15 year planning. The cuts made today can't be assessed for impact on the future if we don't know what the future is.

- Dispel the thinking that a WRM I/O is required to justify keeping an item in engineering development.

- Avoid concurrency and too early injection of item into the procurement appropriation budget to justify the R&D program. If planning is not realistic, the opportunity is lost to properly use procurement funds.

- Increase the participation of the logistics community early in engineering development. (Author's note - HQ AFLC has a detachment now located at ADTC to assist in meeting this goal.)

- More interservice cooperation. (Author's note - AMRAD is attempting to do this with the ROC harmonization procedure.)

- All engineering development should be done by the Deputy for Armament Systems at ADTC rather than some being done by the Air Force Armament Laboratory. (Author's note - currently being studied by ADTC.)

- Require capability ROCs from the user.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

This study has attempted to give the reader a broad understanding of some of the key management areas concerning munitions development and initial production. This chapter draws together the most salient points with conclusions, and recommendations. For ease of association, the conclusions and recommendations for each specific area will be treated together. The recommendations will be a mixture of what should be done tempered by what is feasible. The areas that are covered in this section are requirements, reprogramming flexibility, transition between phases, production planning, and organization.

REQUIREMENTS

Conclusion: The requirements process as it is now operating in the munitions area is not being done according to AFR 57-1 and is stifling alternative generation.

Recommendation: The Air Staff should insure TAC and other users state requirements in terms of mission capability, as required by AFR 57-1, until more than one solution is identified and/or demonstrated. Then it should be allowable to amend ROCs to call for one of the specific solutions identified and demonstrated in advanced development to be pursued in engineering development.

Conclusion: The ROC document does not provide all the necessary information to develop an item to satisfy that ROC.

The pursuit of engineering development without mutual agrement on the parameters leads to products which have a high probability of not satisfying the ROC.

Recommendation: TAC and AFSC establish Memorandum of Agreement (MOA) system to define all needed parameters prior to initiation of engineering development. The stockpile to target sequence* documentation used by the nuclear weapons community should be investigated as a possible model for such an MOA. The user should be invited and encouraged to attend all preliminary and critical design reviews during engineering development. A system should be investigated for mutual sign off by both the user and developer that each agrees with the future planned activities in the program. The practicality of such a system is admittedly questionable. As a minimum, the user should receive and review the minutes of such reviews.

REPROGRAMMING FLEXIBILITY

Conclusion: The flexibility provided by the system described in Chapter III for engineering development is a strong point. The system allows for redistribution of funds by those in a position best able to see where they can be used. The informal portion of the system allows sufficient checks and balances by higher headquarters.

Recommendation: A similar system should be adopted for initial production. While logical, this is practically not possible because each item is a budget line and HQ USAF feels

compelled to control the reprogramming to insure non-violation of Congressional intent.

TRANSITIONS BETWEEN PHASES

Conclusion: A corporate review meeting at some level is appropriate to make recommendations on the transition of items from advanced to engineering development and from engineering development to initial production.

Recommendation: The ADTC ARC continue to be this review for items going into initial production and that it be used for all transitions from advanced to engineering development. These reviews should include TAWC and or TAC representatives. Assuming the above is implemented, that the judgment of HQ AFSC and HQ USAF be exercised in determining the necessity for any formal meetings in addition to staffing of a properly documented package. If meetings are required, they should generally be held at the Directorate level (three letter office) of HQ AFSC and the TAC Panel or other appropriate panel of the Air Staff Board should be used for any Air Staff meeting.

PRODUCTION PLANNING

Conclusion: The process is a "chicken-egg" process and the time constraints are inherent in the PPBS System.

Recommendation: All those involved must recognize this conclusion and act accordingly. Specifically, HQ USAF must pass informal fiscal guidance to HQ AFSC and ADTC as soon as it is available. HQ AFSC and ADTC must plan programs across

a range of quantity and funding possibilities to provide quick reaction to changes.

ORGANIZATION

Conclusion: The dichotomy between engineering development (ADTC/DL) and initial production (ADTC/SD) hampers proper consideration of logistics and hampers smooth transition to initial production.

Recommendation: All engineering development should be placed under the Deputy for Armament Systems (ADTC/SD).

CHAPTER V

AREAS FOR FURTHER STUDY

Based on this study, there are two additional study areas that appear worthwhile. First, a study of other non-major program areas of the Air Force and/or other Services to determine if problems similar to those in munitions occur and what is being done about them. Second, a study of the effect of any reorganization of ADTC on improving both the transition from engineering development to initial acquisition and the consideration of logistics during engineering development.

APPENDIX A

DEFINITIONS

1. Conventional Munitions. This term includes all nonnuclear weapons except chemical, biological and riot control items.

2. Standoff Guided Glide Munitions. Items which are launched at ranges up to 50-75 miles from a target, are guided by distance measuring equipment, autopilots, television, etc., are unpowered, and carry a conventional warhead.

3. Direct Attack. An attack profile which uses straight and level or dive bombing which requires direct or near direct overflight of the target and brings the attacking aircraft into range of terminal defenses.

4. Totally Live Item. All explosive components installed and capable of functioning as designed.

5. Pilot Production: Pilot Production is a limited production run of a new system which has completed engineering development and IOT&E and for which the capability to mass produce the item for inventory needs to be demonstrated. The major objectives are to assure an item can be mass produced at affordable costs, verify that the technical data package is suitable for volume production; acquire a reprocurement data package; and to provide items for FOT&E. All plans prepared under this PMD on items for which volume production is anticipated will include a Pilot Production phase.

6. Stockpile-to-Target Sequence (STS): A document which presents the sequence of events and environments the weapon

is expected to encounter from entry into stockpile through delivery to the target. It is intended to provide the developer with requirements and design goals which amplify the ROC by providing additional detailed information necessary for development. Significant logistic, maintenance, and operational events are depicted along with descriptions of these procedures and events. This STS also contains a description of the probable normal and abnormal environments peculiar to worldwide operations.

7. Tactical Air Forces (TAF). Tactical Air Command (TAC), Pacific Air Forces (PACAF) and U.S. Air Forces in Europe (USAFE). Most ROCs today are TAF ROCs

APPENDIX B

PE 64602F ARMAMENT ORDNANCE DEVELOPMENT

Projects and Tasks

Project	Project/Task Title
2586	Dispenser Munitions
	Combined Effects Bomblet
	Tactical Munitions Dispenser
	(X)Incendiary BLU-63
	(X) Tufted BLU-63
3133	Bombs and Fuzes
	Impact Short Delay Fuze
	Impact Mechanical Fuze
	Low Altitude Proximity Fuze for Laser Guided Bombs
	Modular Dispenser Fuze
4535	Fuel Air Explosives and Flares
	Fuel Air Explosive - II
	(X)Rescue Flares
5613	Munitions Handling, Carriage and Release Equipment
	Air Inflatable Retarder
	Aerial Stores Lift Truck
	Igloo Bomb Lift
	Munitions Transport Loading System

Note: Tasks denoted (X) are managed by ADTC/SD. All others are managed by ADTC/DL

APPENDIX C

TRANSITION FROM ADVANCED TO ENGINEERING DEVELOPMENT

"1. Transition from PE 63601F: Efforts in this technology base advanced development will transition to 6.3B advanced systems integration demonstration or to 6.4 engineering development programs prior to production commitment. Guided weapon developments will transition to PE 63741F Defense Suppression beginning in FY 77. Gun technology efforts will transition to PE 63606F Improved Aerial Gun Systems. Beginning in FY 77, air-to-air missile system prototypes will transition into PE 63213F and PE 63315F. Non-systems equipment[7] and munitions components will transition to PE 64602F Armament/ Ordnance Development for engineering development. The following documentation is required to transition to 6.3B or 6.4 programs from PE 63601F:

(1) AFSC will:

(a) Identify proposed new FY 77 transitions to AF/RDPA[8] no later than 31 Aug 75. A preliminary Program Management Plan (PMP) will accompany the initial AFSC identification of each effort to be transitioned. This is required to support preparation of the FY 77 President's Budget.

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[7]Underlines added for emphasis

[8]RDPA has been absorbed as part of RDQR since the PMD was written

(b) Provide AF/RDP with a firm recommendation for follow-on development to include a statement that established program goals have been obtained and that key technical aspects have been demonstrated. Recommendations should be provided no later than 1 Sep 76 for FY 77 transitions.

(c) Prepare and submit an approved PMP for follow-on development to AF/RDPA no later than 1 Sep 76 or consistent with follow-on program requirements for FY 77 transitions.

(d) Prepare a request for review for legality of weapons in accordance with AFR 110-29.

(2) TAC and SAC will review the proposed transition for compliance with stated operational requirements.

(3) AFLC and ATC will review the efforts proposed for transition to provide comments to AF/RDPA prior to 31 Aug 76 for FY 77 transitions." (3;12)

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